1. 5,616,221, Apr. 1, 1997, Electrolytic ionized water producing apparatus; Hidemitsu Aoki, et al., **204/252, 263, 628, 632**; 205/743, 746, 748 [IMAGE AVAILABLE]

US PAT NO: 5,616,221 [IMAGE AVAILABLE] L27: 1 of 2

ABSTRACT:
An electrolytic ionized water (EIW) producing apparatus comprises an anode, a cathode, an electrolyzer which includes an anode chamber, a cathode chamber and an intermediate chamber, inlet lines for supplying an influent water to the three chambers, and outlet lines for discharging effluent water from the chambers. Further, an acidic electrolyte supplying unit is connected to the outlet line from the anode chamber, and an alkaline electrolyte supplying unit is connected to the outlet line from the cathode chamber. The electrolyte supplying units can selectively control at least the dosage level of elelctrolyte(s) to be supplied, the composition and concentration of the electrolyte(s) or pH of EIW after the addition of the electrolyte(s).

2. 5,593,554, Jan. 14, 1997, Electrolytic ionized water producing apparatus; Koji Yamanaka, et al., **204/252, 263, 275, 628, 632** [IMAGE AVAILABLE]

US PAT NO: 5,593,554 [IMAGE AVAILABLE] L27: 2 of 2

ABSTRACT:
In an electrolytic ionized water (EIW) producing apparatus, a three-chamber electrolyzer includes an anode chamber, a cathode chamber and an intermediate chamber. An influent such as deionized water is supplied to these chamber via inlet lines. Further an electrolyte supplying units are connected to the inlet lines of the anode chamber and the inlet line of the cathode chamber.

said bus bars and to a source of electrical energy whereby the metal contaminant(s) present in such water are deposited on the reticulate cathodes predominantly.

20. 4,096,047, Jun. 20, 1978, Electroanalytical transducers; John Martin Hale, et al., **204/415, 400** [IMAGE AVAILABLE]

US PAT NO: 4,096,047 [IMAGE AVAILABLE] L26: 20 of 22

ABSTRACT:
Electroanalytic transducers for electrochemical analysis of chemical substances are disclosed. The transducers are of the type which include electrodes contacting an electrolyte solution. In accordance with the method and apparatus of the invention, means insulating an electrode are held in a mutually pressing engagement over preselected portions of the electrode to insulate that portion from the electrolyte and prevent creep of the electrolyte between the insulating means and the preselected portions. Thus, the surface area of the electrode exposed to the electrolyte is maintained substantially constant during the service life of the transducer. In a preferred embodiment, sensor or working and counter electrodes are coaxially mounted and circumferentially coaxially separated by annular insulating means. Spring means urge the inner coaxially mounted electrode and the annular insulating means together so that only the surface of the cross-sectional end of the inner electrode is exposed to electrolyte. Thus, a working or sensing surface area of the electrode exposed to electrolyte may be maintained substantially constant during service.

21. 3,959,110, May 25, 1976, Apparatus for silver recovery; Kenneth G. Burgess, **204/228.3, 273, 275**; 366/152.2, 152.4, 182.2, 274 [IMAGE AVAILABLE]

US PAT NO: 3,959,110 [IMAGE AVAILABLE] L26: 21 of 22

ABSTRACT:
Silver is electrolytically recovered from photographic solutons, such as spent hypo, by feeding such a solution to a precollecting or measuring vessel where the solution collects until a predetermined volume has been received, at which time it is automatically dispensed, by a self-triggering siphon, into an electrolysis chamber of larger volume than the pre-collecting vessel and direct current is automatically turned on for a predetermined flow between an anode and a cathode in the chamber to plate out the silver on the cathode. An agitator, preferably a magnetic agitator, is also automatically energized to keep the solution homogeneously mixed during electrolysis, for maximum silver recovery efficiency.

22. 3,839,175, Oct. 1, 1974, ELECTRODEPOSITION OF ENZYMES; Melvin H. Keyes, 435/176; **204/489**; 435/283.1, 287.9, 817 [IMAGE AVAILABLE]

US PAT NO: 3,839,175 [IMAGE AVAILABLE] L26: 22 of 22

ABSTRACT:
Disclosed is a process for electrolytically depositing and immobilizing an enzyme by inducing electrolytic migration of the enzyme in an aqueous dispersion thereof, and intercepting the migrating enzyme on an inert, inorganic, porous, sorptive, dimensionally stable, fluid permeable supporting matrix to form a biologically active composite. Preferably, the supporting matrix is ceramic and is formed by compacting and sintering refractory oxide powders such as alumina.

US PAT NO: 4,528,119 [IMAGE AVAILABLE] L26: 16 of 22

ABSTRACT:
Precursors, particularly of non-oxide ceramics, are prepared by special seeding, under carefully controlled conditions. Such procedures can lead to the preparation of unique powders, which may be useful, for example as abrasives, or further processed in special manner to prepare a variety of metal substances. Such procedures can permit final firing to sintered product.

17. 4,521,281, Jun. 4, 1985, Process and apparatus for continuously producing multivalent metals; Igor V. Kadija, 205/398; **204/216, 230.1, 246, 258, 263, 265; 205/366,** 400 [IMAGE AVAILABLE]

US PAT NO: 4,521,281 [IMAGE AVAILABLE] L26: 17 of 22

ABSTRACT:
An electrolytic cell is described for continuously producing multivalent metals, in particular titanium and titanium alloys. The cell is physically separated into a plurality of zones to better control the stepwise reduction of the multivalent metal. To further increase control over the stepwise reduction process, each zone is also provided with a reference electrode for controlling the voltage potential at each cathode. A process for reducing and plating the multivalent metal is also described.

18. 4,515,672, May 7, 1985, Reticulate electrode and cell for recovery of metal ions; Gary F. Platek, et al., **204/269, 275, 284, 290R, 292, 294, DIG.13;** 588/900 [IMAGE AVAILABLE]

US PAT NO: 4,515,672 [IMAGE AVAILABLE] L26: 18 of 22

ABSTRACT:
A reticulate cathode, for use in an electrolytic cell for scavenging a metal from a solution containing ions of the metal, comprising an open cell electrically conductive foam which has been coated with conductive carbon particles. A cathode assembly comprises an electrically conductive support member to which the conductive foam is secured, the support also serving as the current conductor. The resistivity of the foam is less than 3000 ohm-cm, preferably in the range from about 40-1000 ohm-cm, and it has a pore size in the range from about 10 pores per inch (ppi) to about 100 ppi, and a void fraction in the range from about 0.5 to about 0.98. In its most preferred embodiment, the cathode is preplated with copper in an amount from about 0.5-20 g/ft.sup.2 of active area, sufficient to impart rigidity to the cathde and avoid using a support member.

19. 4,399,020, Aug. 16, 1983, Device for waste water treatment; Kenneth J. Branchick, et al., **204/269, 275, 279, 284, 288, 290F, 290R, 292, 294, DIG.13;** 588/900 [IMAGE AVAILABLE]

US PAT NO: 4,399,020 [IMAGE AVAILABLE] L26: 19 of 22

ABSTRACT:
This invention is directed to a membrane or diaphragm-free electrolytic cell device for removal of a metal(s) present as a contaminant(s) in waste water comprising a nonconductive cell box having an upper peripheral flange, anode and cathode bus bars located on said cell box below said flange, inlet and outlet means to pass the liquid through the electrodes contained in said box, means to space the anodes and cathodes contained within said cell box, a plurality of anodes having openings to permit the flow of waste water therethrough, a plurality of reticulate cathodes, and means connecting the anodes and cathodes, respectively, to

US PAT NO: 5,176,938 [IMAGE AVAILABLE] L26: 13 of 22

ABSTRACT:
A process for the surface treatment of individual particles of a pulverulent material to improve the surface properties thereof. The process includes a plasma-generating apparatus for generating a plasma in a plasmagenerator while supplying an inert gas at a high drift velocity into the generator to form a low temperature plasma flame which is directed into a low pressure zone. Subsequently, the pulverulent material is injected into the high velocity inert gas or into the base of the plasma flame to disintegrate any particle aggregate present in the material. The low temperature plasma acts on the surface of each individual particle to improve the properties thereof. The treated particles can then be recovered from the zone.

14. 5,080,455, Jan. 14, 1992, Ion beam sputter processing; William J. King, et al., 359/350; **204/192.11, 298.04, 298.25**; 359/580, 586, 900; 427/162, 165 [IMAGE AVAILABLE]

US PAT NO: 5,080,455 [IMAGE AVAILABLE] L26: 14 of 22

ABSTRACT:
Surface treatment of a substrate by ion beam sputtering (IBS). The sputtered material impacts on the substrate with a kinetic energy which may be several orders of magnitude higher than in conventional sputter deposition techniques, and material is deposited along a path with high energy directed substantially normal to the target surface, allowing precise control of deposition conditions.
Novel treatment processes with IBS sputtering include coating or activating of circuit board holes, alloying or transformation of surface chemistry, and the deposition of metallic, crystalline or large-molecule coatings which are intimately bonded to a crystalline or amorphous substrate. Special homologous and graded coatings allow the repair of lattice damage in crystalline substrates, and permit the formation of stress free and crystalling layers, and other coatings with diverse electrical, optical, chemical or other physical surface properties.

15. 5,039,561, Aug. 13, 1991, Method for preparing an article having surface layer of uniformly oriented, crystalline, organic microstructures; Mark K. Debe, 427/255.6; **204/192.14, 192.26**; 427/160, 162, 255.7, 384, 385.5, 404, 407.1 [IMAGE AVAILABLE]

US PAT NO: 5,039,561 [IMAGE AVAILABLE] L26: 15 of 22

ABSTRACT:
Method of preparing an article comprising a substrate bearing a microlayer which comprises uniformly oriented, crystalline, solid, organic microstructures. The microstructures may be mono- or polycrystalline. In the preferred embodiment, the microstructures are of uniform shape and size. The articles can be prepared by (1) vapor-depositing an organic compound as a thin, continuous film onto a substrate to provide a composite, and (2) annealing the composite in a vacuum sufficiently to induce a physical change in the original deposited film to form the microstructures. The microlayer can be overcoated with other materials to provide desired properties to the article. Articles of this invention are useful for many forms of light trapping, energy absorption, imaging, data transmission and storage, and gradient index applications.

16. 4,528,119, Jul. 9, 1985, Metal borides, carbides, nitrides, silicides, oxide materials and their method of preparation; Albert L. Barnes, 252/503, **502**, 506, 507, 508, 509; 423/297, 344, 406, 411, 412, 598, 608, 612, 659; 427/215, 443.2, 445; 501/94, 96.3 [IMAGE AVAILABLE]

materials serving as components of electrolytic cells operating at high temperature, by applying to such surfaces a well chosen micropyretic reaction layer from a slurry, which when dried is ignited to initiate a self-sustaining micropyretic reaction, along a combustion front, to produce condensed matter forming such refractory protective adherent coating. The slurry is preferably applied in several layers, the first layer(s) to facilitate adherence and the last layer(s) to provide protection, and may contain some preformed non-reactant materials. The electrolytic cells whose components require such coatings are especially those operating at high temperature with a molten salt electrolyte, particularly those for the production of metals, aluminium being the most important. For these cells the invention provides an aluminium-wettable, adherent, refractory, protective coating for the cell-bottom carbon cathode, containing RHM material such as titanium diboride, as well as other refractory protective coatings for cell wall lining and for other cell components. Novel cell designs for the utilization of the different coatings are also provided.

11. 5,246,916, Sep. 21, 1993, Method of forming shaped superconductor materials by electrophoretic deposition of superconductor particulate coated with fusible binder; John B. Mooney, et al., 505/450; **204/491**; 505/473, 739 [IMAGE AVAILABLE]

US PAT NO: 5,246,916 [IMAGE AVAILABLE] L26: 11 of 22

ABSTRACT:
A process is disclosed for forming shaped superconductors of the metal oxide type by electrophoretic deposition of superconducting particles which comprises providing particulate superconducting material of the metal oxide type coated with a fusible binder, electrophoretically depositing such coated superconducting particles on a substrate, heating the coated substrate sufficiently to fuse the binder to the substrate, fabricating the coated substrate into a desired shape, removing the binder, and then sintering the coated substrate to sinter the superconducting particles together. In a preferred embodiment the process further comprises immersing the coated substrate in an electrostatic field during the fusion step to both orient and maintain the superconducting particles in a desired direction.

12. 5,211,822, May 18, 1993, Process for the production of a semipermeable membrane on a porous conductive support by electrophoresis; Jean-Andre Alary, et al., 210/500.23; **204/472, 474, 479, 509** [IMAGE AVAILABLE]

US PAT NO: 5,211,822 [IMAGE AVAILABLE] L26: 12 of 22

ABSTRACT:
The invention relates to a process for the production of a semipermeable membrane on a porous conductive support. The process involves the stages of finely dispersing in an aqueous or hydroorganic medium, insoluble solid mineral products in the presence of an electrodepositable coating resin, the preparation of an electrophoresis bath by adjusting the composition of the dispersion, deposition by electrophoresis of a layer of resin-coated, solid mineral products on a porous conductive support, possible deposition of several coatings and heat treatment of the porous conductive support and its layer of electrodeposited solid products. This gives filtering membranes suitable for microfiltration, ultrafiltration and reverse osmosis.

13. 5,176,938, Jan. 5, 1993, Process for surface treatment of pulverulent material; Hans I. Wallsten, et al., 427/447; 75/10.19; **204/165, 168**; 427/212, 215, 216, 220, 222 [IMAGE AVAILABLE]

Entry 5 of 23 File: USPT Apr 27, 1993

DOCUMENT-IDENTIFIER: US 5206871 A
TITLE: Optical devices with electron-beam evaporated multilayer mirror

ISY:
1993

BSPR:
A VCSEL is attractive as a device in which the lasing cavity is perpendicular to the top surface of a laser chip, which is small and which may be produced by planar technology. This can lead to a promising future in high density laser arrays, high data transmission in optical communication systems, ultra high parallel processing in optical communication systems, as well as supplying a route for data transmission between electronic chips. Furthermore, the circular-like nature of their beams allows one to efficiently couple the laser light into circular optical fibers.

CLPR:
2. An optical device of claim 1, in which said pairs of quarterwave layers are layers produced by electron-beam evaporation in vacuum environment with substantial absence of oxygen.

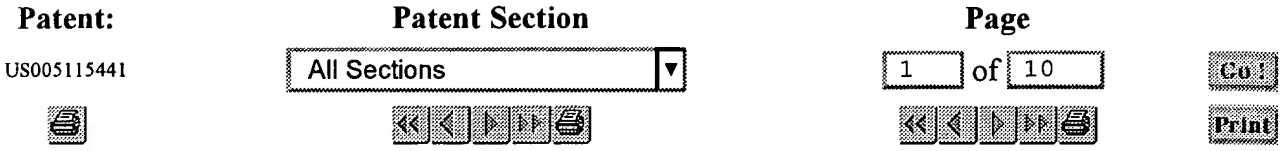
Entry 5 of 23 File: USPT Apr 27, 1993

DOCUMENT-IDENTIFIER: US 5206871 A
TITLE: Optical devices with electron-beam evaporated multilayer mirror

ISY:
1993

BSPR:
A VCSEL is attractive as a device in which the lasing cavity is perpendicular to the top surface of a laser chip, which is small and which may be produced by planar technology. This can lead to a promising future in high density laser arrays, high data transmission in optical communication systems, ultra high parallel processing in optical communication systems, as well as supplying a route for data transmission between electronic chips. Furthermore, the circular-like nature of their beams allows one to efficiently couple the laser light into circular optical fibers.

CLPR:
2. An optical device of claim 1, in which said pairs of quarterwave layers are layers produced by electron-beam evaporation in vacuum environment with substantial absence of oxygen.


Patent:
US005115441
Patent Section
All Sections
Page
1
of
10
Go!
Print

Patent: US005070026

Patent Section All Sections

Page 1 of 6 Go!

Print

Entry 8 of 23 File: USPT Dec 3, 1991

DOCUMENT-IDENTIFIER: US 5070026 A
TITLE: Process of making a ferroelectric electronic component and product

ISY:
1991

ABPL:
An improved process of making a ferroelectric electronic component, such as a non-volatile RAM or an electro-optic switching array, is disclosed. The process essentially includes the separate formation of two subassemblies and then connecting them by placing one on top of the other. Electrical contacts are made by "bumping" or other "flip chip" techniques.

BSPR:
During the next two decades, workers in the field experimented with ferroelectric materials for thin film devices including barium titanate for thermistors, lead titanate for pyroelectric detectors, bismuth titanate for nonvolatile memory devices and lead zirconate titanate (PZT) for capacitors, electro-optic and nonvolatile memory devices. See S. B. Krupanidhi et al, "rf planar magnetron sputtering and characterization of ferroelectric Pb (Zr, Ti) O.sub.3 films, "J. Appl' Phys' 54 (11), November 1983, pp. 6601-6609. Fabrication of such ferroelectric thin film devices included vacuum deposition techniques such as electron beam evaporation, ion-beam deposition, rf sputtering and chemical vapor deposition, and also chemical sol gel processing and coating. See, inter alia, U.S. Pat. Nos. 3,368,920 that issued to A. K. Hagenlocher in Feb. 13, 1968; 3,997,690 that issued to Chen on Dec. 14, 1976; 4,056,654 that issued to Kompanek on Nov. 1, 1977; and 4,636,908 that issued to Yoshihara et al on Jan. 13, 1987. For an optical switch employing a layer of PLZT see U.S. Pat. No. 4,715,680 that issued to Kawaguchi et al on Dec. 29, 1987.

BSPR:
More specifically, it is an object of the present invention to provide a process of making ferroelectric electronic components, such as non-volatile RAM's and optoelectric switching arrays and the components so made, comprising providing a first substrate of a suitable material, forming a conductive larger thereon, forming a layer of ferroelectric material on the conductive layer to form a first subassembly, providing a second substrate of the same suitable material, forming an integrated circuit on this second substrate, forming a plurality of electrical contacts on the integrated circuit to form a second subassembly, and connecting the two subassemblies to form the electronic component by placing one on top of the other such that the plurality of electrical contacts of one subassembly abut and make electrical contact with the layer of ferroelectric material of the other subassembly. Preferably, the substrate material is silicon, gallium arsenide, sapphire or other suitable material with like thermal expansion coefficients. Preferably, the conductive layer is one that does not change its properties even when exposed to oxygen at elevated temperatures, such as a noble metal including gold and platinum, or a conductive oxide, such as, SnO.sub.2 or InSnO.sub.2. Preferably, the ferroelectric material is lead zirconate titanate (PZT), PZLT or lead germanate. Both the conductive layer and the layer of ferroelectric material may be patterned. In an alternate process according to the invention, the layer of ferroelectric material of the first subassembly also is provided with a second conductive layer patterned mirrorlike to reflect the plurality of electrical contacts formed on the second subassembly. As a consequence, when the two

subassemblies are placed one on top of the other, the second patterned conductive layer aligns precisely with the electrical contacts of the second subassembly. The process may utilize any known thin film deposition technique, including sol gel processing. Preferably however, MOCVD and sputtering are employed.

DEPR:
Generally, the illustrated process according to the invention involves the manufacture of electronic components, such as nonvolatile random access memories (NVRAMs), optoelectronic switching arrays, and the like. NVRAM's are computer storage mediums characterized by retaining information even in the absence of power. Integrated optical devices today are densely packed and are required to operate at ever increasing speeds. Thin films materials, some of which are opaque or transparent, particularly of ferroelectric composition exhibit good optically nonlinear properties. As such, these ferroelectric thin film materials are in great demand for, inter alia, integrated optics characterized by high density and speed. The preferred ferroelectric material in thin film device manufacture is lead

DEPR:
The second subassembly 20 is formed separately from the first subassembly 10. The second subassembly 20 is formed on the substrate 22, which preferably also is formed of the same identical material as comprises substrate 12. Consequently, thermal expansion coefficients are matched exactly between the two subassemblies 10 and 20. On the preferably polished and cleaned substrate 22, an integrated circuit 24 is formed. As known, an integrated circuit 24 is essentially an interconnected array of active and passive elements deposited on the substrate 22 in a continuous series cf compatible process steps, which integrated circuit 24 is capable of performing at least one, and probably more than one, complete electronic circuit function. The precise structure of the electronic circuit 24 is, of course, determined by the desired end product being fabricated. As such, it can and does vary widely, not only as between RAMs and switching arrays but also between RAMs and RAMs and switching arrays and switching arrays. One representative sample of an integrated circuit is illustrated in FIG. 9. The illustration in FIG. 9 depicts in plan view a photomicrograph of a simple MOS integrated circuit, which is a three-input logic gate circuit. It is understood that the integrated circuit 24 is used for control and readout and the layer 16 of ferroelectric material functions as a capacitor for the resultant electronic component being fabricated.

DEPR:
A plurality of electrical contacts 26 are next formed on top of the integrated circuit 24. These contacts 26 can be formed by tape automated bonding (TAB) or by flip chip bonding (FCB). Preferably, the plurality of electrical contacts 26 are formed of indium or gold. Indium has proven itself for use in applications when the electronic component may be exposed to wide temperature variations, including cryogenic temperatures. These electrical contacts 26 serve as one set of contacts electrically coupling the integrated circuit 24 to the layer 16 of ferroelectric material serving as the capacitor, when the two subassemblies 10 and 20 are connected into an electronic component 30, as illustrated in FIG. 3. The connection is effected by placing one subassembly 20 on top of the other subassembly 10 such that the plurality of electrical contacts 26 abut the layer 16 of ferroelectric material. Thereafter, the thus completed electronic component 30 is finalized for its end-use, depending on whether it is a RAM, a NVRAM, an optoelectronic switching array or some other device.

DEPR:
An electronec component, such as an electro-optic switching array, is formed by sputtering according to the inventive process as follows, employing a Vactek dc magnetron sputtering system.

DEPR:
Thus it has been shown and described an improved process of making an electronic component, such as a NVRAM or an electro-optic switching array, which process satisfies the objects and advantages set forth above.

CLPR:
7. A process of making an optoelectronic switching array comprising:

Entry 12 of 23 File: USPT Jan 29, 1991

DOCUMENT-IDENTIFIER: US 4988157 A
TITLE: Optical switch using bubbles

ISY:
1991

BSPR:
The invention relates generally to optical switches. In particular, the invention relates to a bistable optical switch that can be implemented in an integrated array.

DEPR:
As further illustrated in the plan view and block diagram of FIG. 3, a 5 mil (125 .mu.m) saw was used to cut a slot 60 extending downward from the surface through a substantial portion of the buffer layer 54 and extending axially at 45.degree. to the intended optical axis. Then, a first electrode 62 and a second electrode 64 were simultaneously deposited by a electron-beam evaporation process standard in semiconductor fabrication. Preferably, the electrodes 62 and 64 additionally perform as catalysts so that the electrode material was Pt on an adhesion layer of Ti. The electrode materials were were deposited to a width of .about.1 mm and thicknesses of 50 nm for the Ti and 100 nm for the Pt. The photolithographic mask had a single stripe for both electrodes 62 and 64 but the deposition of electrode material into the slot 60 had no deleterious effect. In a separate experiment, the electrodes 62 and 64 were offset from each other along the slot 60 without any significant changes observed.

DEPR:
The bubble is created electrolytically. Power is applied between the cathode lead 86 of which that cathode 90 is formed and the anode lead 84 of which the nearest anode 92 is formed. This selection of two leads 84 and 86 amounts to matrix addressing of the array. The terminology assumes that a positive voltage is applied to the cathodes 90 and negative voltage to the anodes 92; however, the voltages can be reversed with the understanding that the locations of the H.sub.2 and O.sub.2 bubbles will be reversed. Nonetheless, the electrolytically created H.sub.2 bubble will be twice as big.

DEPR:
The invention thus provides a simple, inexpensive and bistable optical switch. Even though the switching times have not yet been optimized, they are clearly adequate for a cross-connect. The fabrication techniques required to build such a switch are well known and are amenable to building large switching arrays. Cross-talk and transmission and reflection losses exist but appear to be acceptable for many applications.

Entry 12 of 23 File: USPT Jan 29, 1991

DOCUMENT-IDENTIFIER: US 4988157 A
TITLE: Optical switch using bubbles

ISY:
1991

BSPR:
The invention relates generally to optical switches. In particular, the invention relates to a bistable optical switch that can be implemented in an integrated array.

DEPR:
As further illustrated in the plan view and block diagram of FIG. 3, a 5 mil (125 .mu.m) saw was used to cut a slot 60 extending downward from the surface through a substantial portion of the buffer layer 54 and extending axially at 45.degree. to the intended optical axis. Then, a first electrode 62 and a second electrode 64 were simultaneously deposited by a electron-beam evaporation process standard in semiconductor fabrication. Preferably, the electrodes 62 and 64 additionally perform as catalysts so that the electrode material was Pt on an adhesion layer of Ti. The electrode materials were were deposited to a width of .about.1 mm and thicknesses of 50 nm for the Ti and 100 nm for the Pt. The photolithographic mask had a single stripe for both electrodes 62 and 64 but the deposition of electrode material into the slot 60 had no deleterious effect. In a separate experiment, the electrodes 62 and 64 were offset from each other along the slot 60 without any significant changes observed.

DEPR:
The bubble is created electrolytically. Power is applied between the cathode lead 86 of which that cathode 90 is formed and the anode lead 84 of which the nearest anode 92 is formed. This selection of two leads 84 and 86 amounts to matrix addressing of the array. The terminology assumes that a positive voltage is applied to the cathodes 90 and negative voltage to the anodes 92; however, the voltages can be reversed with the understanding that the locations of the H.sub.2 and O.sub.2 bubbles will be reversed. Nonetheless, the electrolytically created H.sub.2 bubble will be twice as big.

DEPR:
The invention thus provides a simple, inexpensive and bistable optical switch. Even though the switching times have not yet been optimized, they are clearly adequate for a cross-connect. The fabrication techniques required to build such a switch are well known and are amenable to building large switching arrays. Cross-talk and transmission and reflection losses exist but appear to be acceptable for many applications.

Entry 17 of 23 File: USPT Jan 5, 1988

DOCUMENT-IDENTIFIER: US 4718052 A
TITLE: Head assembly for optical disc

ISY:
1988

DEPR:
Referring now to FIG. 18, there is illustrated an optical head assembly based on the above principle according to the present invention, in which the numeral 31 denotes a substrate having an elastic optical effect, which is formed of LiNbO.sub.3 (lithium niobate), and the numeral 32 denotes a light conducting layer formed by a thin film on the surface of the substrate 31. In the case of a LiNbO.sub.3 substrate, the light conducting layer 32 is formed by forming titanium film on an optically polished substrate surface to a thickness of several hundred angstrom by sputtering or electron beam evaporation, followed by heat diffusion. The numeral 33 denotes a semiconductor laser chip (LD) mounted on an end face of the light conducting layer 32. Emitted light beam 34 is propagated through the light conducting layer 32. The numeral 35 denotes a collimator lens formed on the light conducting layer 32 and the numeral 36 denotes a guided beam collimated by the lens 35.

DEPR:
An optical sensor having both tracking sensor function and focus sensor function is described, for example, in the "Philips Technical Review", Vol. 40, No. 6 (1982), p. 150. This known optical sensor is of such a structure as shown in FIG. 21. In FIGS. 21(a), (b) and (c), the numeral 151 denotes a semiconductor laser; numeral 152 denotes a beam emitted from the semiconductor laser 151; numeral 153 denotes a beam splitter for separating a reflected beam 156 from emitted beam 155 at its reflection surface 154; numeral 157 denotes a collimator lens for changing the emitted beam 155 to a collimated beam 158; numeral 159 denotes an objective lens for converging the collimated beam 158 as a beam spot 162 on an information surface of an optical disc 160; numeral 163 denotes a pit as an information unit formed on the information surface 161, the pit 163 being, for example, 0.4-0.5 .mu.m wide, 2-4 .mu.m long and about 0.1 .mu.m deep. Numeral 164 denotes an information track with pits 163 arranged in series; numeral 165 denotes a focusing actuator which moves the objective lens 159 in a direction Y perpendicular to the information surface to let a focal position of the objective lens coincide with the information surface 161 (this state will hereinafter be referred to as "in-focus" state) in accordance with a signal (hereinafter referred to as "focusing error signal") indicative of a deviation of the information surface 161 from the focal position of the objective lens. Numeral 166 denotes a wedge prism for dividing the reflected beam 156 into two beams 167 and 168, and numeral 169 denotes a photo detector comprising two photo detectors 169a and 169b which are constituted respectively by two elements D.sub.1, D.sub.2 and two elements D.sub.3, D.sub.4, the spacing of D.sub.1 and D.sub.2 and that of D.sub.3 and D.sub.4 being each 5 to 10 .mu.m. The reference marks A.sub.1, A.sub.2, A.sub.3 and A.sub.4 denote outputs of the four elements D.sub.1, D.sub.2, D.sub.3 and D.sub.4, respectively, of the photo detector 169.

Patent: US004718052

United States Patent [19]
Kondo et al.

[11] Patent Number: 4,718,052
[45] Date of Patent: Jan. 5, 1988

[54] HEAD ASSEMBLY FOR OPTICAL DISC

[75] Inventors: Mitsushige Kondo; Shinsuke Shikama; Keizo Kono; Teruo Fujita, all of Kyoto, Japan

[73] Assignee: Mitsubishi Denki Kabushiki Kaisha, Tokyo, Japan

[21] Appl. No.: 781,993

[22] Filed: Sep. 30, 1985

[30] Foreign Application Priority Data

Oct. 1, 1984 [JP] Japan 59-205788
Oct. 1, 1984 [JP] Japan 59-205789
Oct. 12, 1984 [JP] Japan 59-213801
Feb. 19, 1985 [JP] Japan 60-30842

[51] Int. Cl.[4] G11B 7/095
[52] U.S. Cl. 369/44; 369/122; 369/120; 369/112; 369/46; 350/96.11; 350/96.18; 350/96.19; 250/202
[58] Field of Search 369/122, 121, 120, 112, 369/111, 46, 45, 44; 250/201, 202; 350/96.13, 96.14, 96.11, 96.12, 96.18, 96.19

[56] References Cited

U.S. PATENT DOCUMENTS

4,425,023 1/1984 Matsumoto 369/122
4,468,084 8/1984 Hutcheson 350/96.11
4,518,219 5/1985 Leonberger 350/96.19
4,640,574 2/1987 Unger 350/96.11

FOREIGN PATENT DOCUMENTS

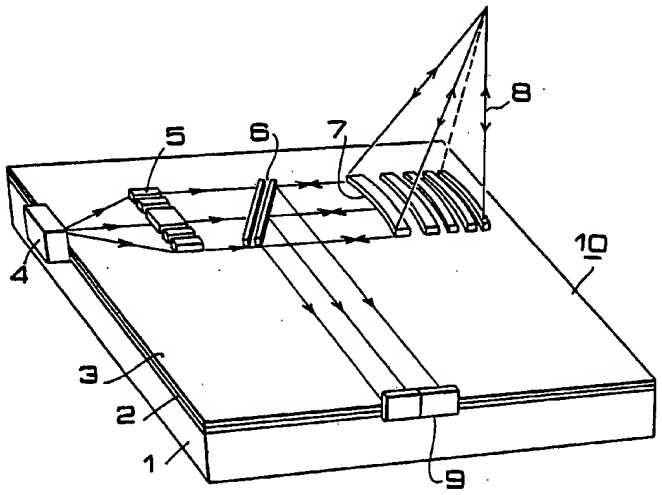
79441 5/1984 Japan 369/122
107431 6/1984 Japan 369/122

Primary Examiner—Alan Faber
Attorney, Agent, or Firm—Bernard, Rothwell & Brown

[57] ABSTRACT

An optical head assembly for recording information on an optical disc or for taking out information already recorded, the optical head assembly including a semiconductor substrate and a dielectric light conducting layer formed on the substrate, the light conducting layer being internally formed with optical elements for converging laser beam from a laser beam source onto the optical disc and directing the reflected beam from the optical disc surface toward a photo detector. Output signal from the photo detector is used for reading information and also for allowing the optical head assembly to trace a track on the optical disc.

14 Claims, 52 Drawing Figures



Patent: US004311725

United States Patent [19]

Holland

[11] **4,311,725**

[45] **Jan. 19, 1982**

[54] **CONTROL OF DEPOSITION OF THIN FILMS**

[75] Inventor: **Leslie Holland**, Crowley, England

[73] Assignee: **National Research Development Corporation**, London, England

[21] Appl. No.: **192,524**

[22] PCT Filed: **Aug. 10, 1979**

[86] PCT No.: **PCT/GB79/00138**

§ 371 Date: **Apr. 18, 1980**

§ 102(e) Date: **Mar. 20, 1980**

[87] PCT Pub. No.: **WO80/00504**

PCT Pub. Date: **Mar. 20, 1980**

[30] **Foreign Application Priority Data**

Aug. 18, 1978 [GB] United Kingdom 33927/78

[51] **Int. Cl.**³ **G05D 5/03**; C23C 13/08; C23C 15/00; G01B 7/06

[52] **U.S. Cl.** ..... **427/10**; 118/664; 118/665; 204/192 R; 204/298

[58] **Field of Search** ..... 118/664, 665; 427/10; 204/192 R, 298

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,400,687 9/1968 Lueck ..... 118/665 X

OTHER PUBLICATIONS

Lue, "An Optimum Thickness Indicator for Evaporating Metals on Schottky Barrier Solar Cells", *Journal of Physics E: Scientific Instruments*, vol. 11, Jan. 1978, pp. 84–86.

Putner, "The Vacuum Deposition of Metaloxide Films by Automatic Control", *Optics and Laser Technology*, vol. 4, No. 2, Apr. 1972, pp. 79–86.

Leybold-Heraeus, "Optical Monitoring of the Production of Thin Films in Vacuum", undated.

Vidal et al., "Optical Monitoring of Nonquarterwave Multilayer Filters", *Applied Optics*, vol. 17, Apr. 1, 1978, pp. 1038–1047.

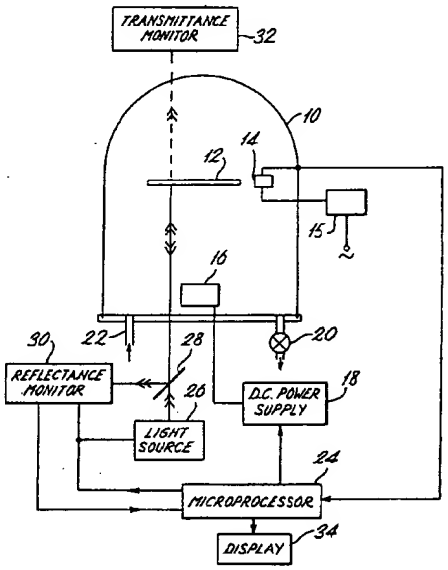
Primary Examiner—James R. Hoffman

Attorney, Agent, or Firm—Cushman, Darby & Cushman

[57] **ABSTRACT**

In apparatus for sensing and controlling the deposition of a thin film on to a substrate (12) from a gas or vapor phase, the optical reflectance or transmittance is sensed, the resonant frequency of a crystal (14) also exposed to the deposition is sensed, and the quotient of the change in each signal over a predetermined time interval is determined. The deposition can be terminated at a suitable thickness, for example a reflectance or transmittance maximum or minimum. Instead of an optical property, the electrical resistivity of the film may be sensed and used in the same way.

10 Claims, 6 Drawing Figures



Entry 21 of 23 File: USPT Jan 19, 1982

DOCUMENT-IDENTIFIER: US 4311725 A
TITLE: Control of deposition of thin films

ISY:
1982

BSPR:
Films of this thickness are often applied to a substrate to alter the reflection properties of the substrate, for example to glass to give an anti-reflecting surface at visible wavelengths, or to a semi-conducting material to give an anti-reflecting surface at infra-red wavelengths; the films may also be applied to provide beam splitters and broad and narrow band-pass filters at ultra-violet, visible, and infra-red wavelengths, or to give mechanical protection to a surface or to impart electrical conductivity to it. Single layer films may be required, or multilayer films comprising films of different optical properties. The films may be applied by any physical vapour deposition (PVD) or chemical vapour deposition (CVD) process. In a PVD process, a material is sputtered or evaporated; examples are d.c. sputtering, radio frequency sputtering, magnetron sputtering; electron beam evaporation; ion plating; and glow discharge. In a CVD process a material is decomposed by heat, optionally into a plasma, and optionally an active gas may be added. In some examples of both basic types of decomposition, an ionised atmosphere is generated in the vicinity of the substrate. Materials used vary over a very wide range, and may be elements or compounds, metals, semiconductors, or insulators.

BSPR:
It has also been suggested that, to allow precise control of the final film thickness, it would be desirable to measure the differential with respect to time t of reflectance or transmittance, i.e. dR/dt or dT/dt. This has the disadvantage that it is assumed that the film optical thickness nL increases linearly time. In practice this is not the case; for example when a powder source is used, volatilization may occur as a series of discrete events as particles come into contact with the heat source; this causes fluctuations and instabilities which are undesirable.

DEPR:
FIG. 2 shows a typical curve obtained by monitoring film growth using a conventional beam photometer and plotting reflectance against time. The curve irregularities are due to several effects such as instabilities in the deposition rate; for example if a powder is evaporated, volatilization may occur as a series of discrete events as particles come into contact with the heat source; alternatively, during a sputtering process, gas may be released from a target compound, which results in a change in ion density in the gas and a variation in deposition rate. Such instabilities cause changes in the mass growth rate, which affects the rate of increase of geometrical thickness, and may also have secondary effects on the optical thickness if the film density and refractive index are dependent on growth rate.

DEPR:
In the second embodiment the invention is utilised in otherwise conventional apparatus for preparing multilayer interference filters by magnetron sputtering. In magnetron sputtering, metals are sputtered in oxygen-containing atmospheres to deposit oxide films. A reduced pressure of between 10.sup.-3 and 10.sup.-2 torr is used and a magnetic field is superimposed on the electrode arrangement so that

is used and a magnetic field is superimposed on the electrode arrangement so that the electrons are trapped in magnetic loops and follow cycloidal paths. FIG. 6 shows a vacuum chamber 40 having a central circular cathode support 42 carried by a hollow stem 44 insulated from the chamber baseplate 46. The support 42 is water cooled and the stem has water inlet and outlet pipes 48, 50. A circular array of small magnets 52 is arranged with their axes radial to the cathode support and their upper surfaces flush with the surface of the support; the loop-shaped magnetic fields are illustrated by the dotted lines. The support is partly shielded by a grounded metal shield 53. The chamber 40 can be evacuated by a pump 55.

Entry 22 of 23 File: USPT Nov 11, 1980

DOCUMENT-IDENTIFIER: US 4233506 A
TITLE: Photo-sensor

ISY:
1980

ABPL:
A pboto-sensor wherein a bundle of optical fibers is disposed within a predetermined substrate, the optical fiber bundle extending from a first surface to a second surface of the substrate and being formed to be flat, an array of photosensitive elements which have photosensitive parts on an open end face of the optical fibers at the first surface of the substrate is disposed integrally with the substrate, and an end face of the optical fibers at the second surface of the substrate serves as an information reading surface.

BSPR:
Heretofore, a linear silicon photodiode array has been generally employed as the photosensitive element of a facsimile transmitter, optical character recognition etc. Since, however, silicon is subject to limitations in the size of a producible single crystal and in the processing technique, the length of the linear silicon photodiode array has a limit. At present, the length of the linear silicon photodiode array achievable is only about 30 mm at the utmost. On the other hand, an original picture to be read has a width of, for example, 210 mm in the A4-size. Accordingly, in case of reading the original picture of the A4-size with the linear silicon photodiode array, the original picture is scaled down and imaged on the linear silicon photodiode array by the use of a lens system.

BSPR:
FIG. 1 is a view for explaining this principle. Numeral 1 designates an original picture, numeral 2 a lens, and numeral 3 a linear silicon photodiode array. In this case, a certain distance is inevitably required between the original picture and the linear silicon photodiode array. This is very unfavorable for the miniaturization of the input device. In addition, in case of using such a lens system, there are the disadvantages that the positioning of the lens requires much labor and that a degraded resolution of a peripheral part and an insufficient quantity of light arise.

BSPR:
FIG. 2 is a view showing the operating principle of the prior art. In the figure, numeral 4 designates an original picture, and numeral 5 denotes 1,280 optical fibers each having a diameter of 125 .mu.m. One side of the optical fibers close to the original picture is in the form of a sheet, while the other side is distributed to 20 linear silicon photodiode arrays (S.sub.1 -S.sub.20). The linear silicon photodiode array consists of 64 photodiodes. FIG. 3 is an enlarged sectional view of the joined part between the optical fibers and the linear silicon photodiode array. In this figure, numerals 61-66 indicate optical fibers, and symbols S.sub.1 -S.sub.6 silicon photodiodes. The pitch of the silicon photodiodes is indicated by D, the spacing between the silicon photodiode and the optical fiber is indicated by d.sub.1, and the misalignment between the silicon photodiode and the optical fiber is indicated by d.sub.2. The optical fibers and the photodiodes correspond at 1:1. In order to prevent the breakage of the photodiode, a clearance d of about several hundreds .mu.m needs to be provided between the optical fiber and the photodiode. The clearance lowers the resolution

of the photo-sensor drastically. After all, the photo-sensor having such a structure is meritorious over the photo-sensor employing the lens system in that the degradation of the resolution of the peripheral part and the insufficient quantity of light can be avoided, but it is not practical on account of disadvantages as listed below.

BSPR:
1. The optical fibers of the structure, in which one side is in the form of the very thin sheet and the other side is distributed to the 20 linear silicon photodiode arrays, eventually needs some extent of length. This is unfavorable for the miniaturization of the device. Moreover, there is a high possibility that the optical fibers will be broken by mechanical shocks such as vibrations.

BSPR:
3. In order to prevent the destruction of the linear silicon photodiode array, the optical fibers must be floated in use. This degrades the resolution drastically.

BSPR:
In order to accomplish the objects, the photo-sensor of this invention fundamentally adopts a construction as described below. Within a predetermined substrate, a bundle of optical fibers is disposed which extends from a first surface to a second surface. Photosensitive elements in the form of an array are disposed in such a manner that their photosensitive parts lie on an end face of the optical fibers at the first surface of the substrate. At this time, the photosensitive elements are made integral with the substrate by such an expedient as vacuum-deposition. The array of photosensitive elements is arranged in the main scanning direction for reading information. An end face of the optical fiber bundle at the second surface of the substrate functions as an information reading surface.

DEPR:
FIGS. 5a and 5b show a plan view and a sectional side elevation in the case where a linear photodiode array is disposed as photosensitive elements on a fiber plate, respectively. In the figures, numeral 12 designates a fiber plate, and numeral 13 a photosensitive material. Numerals 14 and 14' designate a lower electrode and an upper electrode, respectively. Needless to say, at least that part of the lower electrode 14 which forms a photosensitive part is transparent. The lower electrodes 14 and the upper electrodes 14' are alternate, and the photoelectric material parts 13 are disposed in the intersecting regions in a manner to be held between the electrodes. In this example, the upper electrodes are constructed of a common electrode, and the lower electrodes are stripe electrodes. In many cases, one of the two sorts of electrodes and the photosensitive material form a diode, and the photosensitive element operates as the photodiode. As the photosensitive material, there can be used a photoelectric material which can be prepared by vacuum-deposition. It includes, for example, an amorphous semiconductor of Se-As-Te system, CdSe, CdTe, PbS, etc.

DEPR:
The construction of a fiber plate used here is shown in FIG. 6. It is a plate obtained by putting optical fibers together and fusing and bonding them. The respective fibers are buried at an angle of 75.degree. with respect to the bottom surface of the plate. The left end of the plate is cut at an angle of 50.degree. so that light may enter. The optical fibers employed here have a diameter of 25 .mu.m. FIG. 7 is a plan view of an electrode structure in the case where an array of photosensitive elements is disposed on the fiber plate. Sectional views for explaining the manufacturing steps of a photo-sensor are given in FIGS. 8a-8f. Referring to FIG. 7, numeral 15 designates a fiber plate, numeral 16 an SnO.sub.2 transparent electrode, and numeral 17 a Cr electrode. The width of the electrodes is 200 .mu.m, and the spacing between the electrodes is 250 .mu.m. Referring to FIGS. 8a-8f, the fabricating procedures of the photo-sensor will be explained. An SnO.sub.2 transparent electrode film 19 is deposited to a thickness of 100 nm on the surface of a fiber plate 18 shown in FIG. 8a, and a Cr film 20 is formed to a thickness of 100 nm on the SnO.sub.2 film 19 by the vacuum-deposition (FIG. 8b). Unnecessary parts of the Cr film 20 are removed by the conventional photoresist process, to form stripe Cr electrodes. Using the remaining Cr film 20 as a mask, unnecessary parts of the SnO.sub.2 transparent conductive film 19 are removed by the ion-beam etching (FIG. 8c). Lastly, the front end parts of the Cr stripes are removed by the photoresist process. Then, windows 21 of the transparent

electrodes for entering light are formed as shown in FIG. 8d. On the stripe electrodes thus obtained, an Se-As-Te system amorphous semiconductor layer 22 having a thickness of 2 .mu.m is formed (FIG. 8e). The amorphous semiconductor layer is formed by preparing the respective evaporation sources of Se, As and Te and executing the mask-evaporation under a pressure of 2.times.10.sup.-4 Pa (.about.10.sup.-6 Torr). As the thickness of the layer, a value of 0.5 .mu.m-5 .mu.m is practical. The fabrication of the photosensitive material layer may well be done by the sputtering or the electron-beam evaporation. Further, an upper electrode which is made of a metallic thin film 23 of gold (Au) or the like is formed on the amorphous semiconductor layer 22 by the mask-evaporation (FIG. 8f). In this example, a P-N junction is formed by tin oxide (SnO.sub.2) of the transparent electrode 19 and the Se-As-Te system amorphous semiconductor 22, and it operates as a photodiode. In this way, a linear image sensor has been formed on the fiber plate. Those parts of the stripe electrodes which are other than the windows for the entrance of light 21 are covered with the chromium film and are opaque. Accordingly, the light receiving area of each photodiode is equal to the area of the transparent electrode window 21.

DEPR:
In this manner, the photo-sensor wherein the linear photodiode array is integrally provided on the fiber plate can read the information by merely putting it on the original picture, and it does not require the adjustment of a lens system. Here will be explained a method of illumination for enhancing the utilization factor of light.

DEPR:
FIG. 11 is a sectional view of a device showing an example in which an optical guide is employed for illumination. Numeral 28 designates a light source such as tungsten lamp and fluorescent lamp. Light emergent from the light source 28 is reflected by a reflector 29, and is focused on an optical guide 80. The optical guide 80 is constructed in such a way that a plate 30 of a transparent material such as glass is covered with a metal such as Al 31 except its parts of an entrance surface 32 and an exit surface 33 for light. The light emergent from the exit of the optical guide is scattered on an original picture 34 and enters a linear diode array 35. This method raises the utilization factor of the light, and simultaneously prevents the photodiodes from undergoing a temperature rise due to the radiation heat of the light source.

DEPR:
FIG. 12 is an explanatory view in the case of employing a light emitting diode as a light source. Numeral 36 indicates a metallic block serving also as a heat sink. In order to uniformly illuminate an original picture, a light emitting diode array 37 in which light emitting diodes are arranged at equal intervals is mounted on the fore end of the metallic block 36. Light scattered by the original picture 39 enters the photo-sensor 38. An advantage of this method is that the light emitting diodes are small. Moreover, since they are the light source of low temperature, they can be brought extremely close to the part of the original picture 39 to be read. Accordingly, the utilization factor of light is remarkably enhanced.

DEPR:
Further, an upper electrode made of a metal thin film 46 is formed on the photosensitive material layer 45 by the mask-evaporation (FIG. 14c). Then, an array of photoelectric elements has been formed on the fiber plate.

DEPR:
FIG. 15 shows a sectional view of a fiber plate used here. This plate is an example wherein the plate as described in Embodiment 1 or Embodiment 2 is provided with a reflective film. Numeral 48 designates an optical fiber portion, and numeral 49 an evaporated film of Al, Cr or the like for reflecting light. The evaporated film 49 is formed by the mask-evaporation or any working process employing the photoresist. The reflecting evaporated film 49 is disposed in order to prevent light from entering from the other part than the required fiber portion. An array of photosensitive elements is formed on the fiber plate by quite the same method as in Embodiment 2. In case of Embodiment 2, the unnecessary light is absorbed, whereas in case of Embodiment 3, the light is reflected, which is advantageous in enhancing the utilization factor of light.

DEPR:

In the embodiments described thus far, the optical fibers are buried obliquely to the plane of the fiber plate. However, the optical fibers may well be buried vertically to the plane of the plate. FIG. 16 shows a sectional view of such an example. Numeral 50 designates a plate made of a material which can be readily bonded with optical fibers 51 (for example, a glass plate which is either transparent or opaque). It is also allowed to make the whole structure a bundle of optical fibers. In this case, a predetermined light-intercepting film needs, of course, to be provided. The bundle of optical fibers 51 is arranged perpendicularly to the surface of the plate 50. A part of the bottom of such a plate is removed. In the resultant hollow, an optical guide 52 which guides light for illuminating an original picture 53 is placed. Although the optical guide 52 may be a thin glass plate, the use of a structure in which optical fibers are arranged in the form of a sheet is more meritorious when the utilization factor of light is taken into account. Such a structure is shown in FIG. 17. In this figure, numeral 54 indicates optical fibers. The front ends of the respective fibers are obliquely cut as illustrated in FIG. 17. This serves to illuminate the original picture more effectively. The optical guide made of the optical fibers must employ an elongate light source in the case as illustrated in FIG. 17. In this respect, an optical guide 55 one end of which is in the shape of a sheet and the other end of which is circular as depicted in FIG. 18 has the advantage that a single electric lamp 56 suffices. A linear photodiode array is formed on the aforecited fiber plate by quite the same method as in Embodiment 2.

DEPV:
4. Since the photosensitive elements are formed by the vacuum-deposition, the elongation of the photodiode array is easy.

CLPR:
1. A photo-sensor comprising a predetermined substrate, a bundle of optical fibers which is disposed in said substrate and which extends from a first surface to a second surface of said substrate, and an array of photosensitive elements which is integrated onto said substrate, said photosensitive elements having photosensitive parts on an end face of said optical fibers at said first surface of said substrate, an

CLPR:
2. A photo-sensor comprising a predetermined substrate, a bundle of optical fibers which is disposed in said substrate, which extends from a first surface to a second surface of said substrate and which is formed in the shape of a sheet, and an array of photosensitive elements which is integrated onto said substrate, said photosensitive elements having photosensitive parts on an end face of said optical fibers at said first surface of said substrate, an end face of said optical fibers at said second surface of said substrate serving as an information reading surface.

Main Menu | Search Form | Result Set | Show S Numbers | Edit S Numbers | Referring Patents
First Hit | Previous Document | Next Document
Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC
Help | Logout

Entry 13 of 17 File: USPT Nov 21, 1995

DOCUMENT-IDENTIFIER: US 5468606 A
TITLE: Devices for detection of an analyte based upon light interference

BSPR:
Nygren et al, U.S. Pat. No. 4,558,012 describe a similar system except that the overall array of layers is adapted to reduce reflection in respect to non-monochromatic or white light in the wavelength range of 525-600 nM.

BSPR:
In preferred embodiments, the device is provided with step means to allow stepped movement of the lid relative to the base; the lid has a series of apertures which allow selected access to the surfaces during use of the device; the lid has an elongated aperture and wherein the base comprises a series of indicia, wherein the elongated aperture cooperates with the indicia to indicate a method for use of the device; the analyte of interest is the Human Immunodeficiency Virus (HIV) I or II or a combination thereof, Streptococcus Group A, Streptococcus Group B, RSV (Respiratory Syncytial virus), Hepatitis B, a Chlamydia species, HSV (Herpes Simplex virus), an antigen, an antibody, nucleic acid, oligonucleotides, chelators, enzymes, bacteria, viruses, hormones and receptors for the materials; and the device is configured and arranged to measure the presence of amount of Streptococcus A antigen, Streptococcus B, RSV, Chlamydia or a Hepatitis antigen; and has an optically active receptive surface.

DRPR:
FIG. 14 is a diagrammatic representation of two thin film analyzers useful in the present invention in which one uses a monochromatic light source and a single photodiode or array, and the other uses a polychromatic light source and a photomultiplier detector;

DEPR:
When a change in the transmitted light is to be made independent of any color, an AR film is not required. The only requirement for the substrate in this application is that some component or components of the incident light be transmitted, and that a change in mass or character on the uppermost surface of the test piece modifies the transmitted light in a detectable manner. Materials such as the Irtran series produced by Eastman Kodak may be of use in this application for monitoring changes in the infrared (IR) properties of these films.

DEPR:
Multi-layer optical thin film coatings may be deposited by electron beam evaporation. A substrate is mounted in a vacuum deposition chamber, and suspended over two or more crucibles of the various material to be evaporated. Each crucible is then heated by an electron-beam gun, and the rate of evaporation monitored using a crystal thickness monitor. Each crucible is covered by a movable shutter. By alternately opening and closing the shutters, the substrate is exposed sequentially to each vapor stream, until the desired multi-layer stack has been deposited, or a multi-component film is deposited. The described procedure may be generalized to more than two crucibles in order to deposit multiple layers of various optical thin film materials, or multi-component films tailored to a specific refractive index.

DEPR:

A wide range of techniques can be used to adhere the receptive material to the attachment layer. Test surfaces may be coated with receptive material by: total immersion in a solution for a pre-determined period of time; application of solution in discrete arrays or patterns; spraying, ink jet, or other imprinting methods; or by spin coating from an appropriate solvent system. The technique selected should minimize the amount of receptive material required for coating a large number of test surfaces and maintain the stability/functionality of receptive material during application. The technique must also apply or adhere the receptive material to the attachment layer in a very uniform and reproducible fashion.

DEPR:
Specifically, referring to FIGS. 9A-9E, there is provided in diagrammatic representation a multi-test device of the present invention. This specific example is designed to test for the presence of E. coli, Streptococcus B, Streptococcus pneumoniae, H. influenza and N. meningitidis. Generally, this device is constructed with a plurality of test devices, namely five test devices, 100, 102, 104, 106 and 108. The device has an upper slidable cover 110, a lower shelf portion 112 which includes a large thick filter material 114 which is removable from section 112 by use of a wire loop 116. Upper cover is provided with three series of five apertures 120, 122 and 124 and with a large rectangular aperture 126. On its under surface are provided two absorbent wipes 128 and 130 formed of a filter material, and adhesively bonded to the lower surface of cover 110. General indicia may also be provided on the surface of cover as shown at 146, 148 and 150.

DEPR:
Also provided are a series of three cylindrical extensions extending approximately 4 mm from the inner surface of cover 110, labeled 132, 134, 136, 138, 140 and 142. The cylindrical extensions are adapted to mate with spaces 152 provided in the lower portion of portion 112 such that each row of apertures in the upper cover can be specifically positioned over the test devices or other indicia in lower portion 112, as desired. This movement is shown generally in FIG. 9B by arrows 154 and 156.

DEPR:
Lower portion 112 is further provided with an aperture 158 located to allow excess liquid on test surfaces 100, 102, 104, 106 and 108 to drain within portion 112 and to be absorbed by filter 114. Lower portion 112 is further provided with a series of instructions shown as 160 which are revealed in turn as cover 110 is moved in a stepwise fashion as dictated by the mating of cylindrical extensions 132, 134, 136, 138, 140 and 142 relative to spaces 152 along slidable portion 164 so that the user of the device has an indication of what step is needed to perform an assay of the invention. The upper and lower portions are constructed such that the filter paper 128, 130 is caused to contact the surface of each test device at an appropriate time in the assay procedure.

DEPR:
In another configuration, the test surfaces can be made as a series of longitudinal strips with filter material on either or both longitudinal edges, and arranged to fit within a 96-well configuration.

DEPR:
Referring to FIG. 14, there are shown two devices in which no polarizers are provided, and in which a thin film can be analyzed either with a single photodiode, an array, or a CCD detector array, or with a reflectometer a photomultiplier detector.

DEPR:
A photodiode array may be programmed to dedicate individual photodiodes to measure the intensity of reaction zones or spots, while other photodiode arrays measure the background, or control zones. Simultaneous measurement of the spot intensity and the background intensity allows each reading to be accurately corrected for test surface background.

DEPR:
Either a linear array or a matrix array may be used. A linear array may only measure along one, pre-set axis of the sample spot depending on the size and resolution available in the arrays. The matrix array could measure the entire

reacted spot plus background.

DEPR:
Specifically, two such instruments are represented diagrammatically in FIG. 14. The thin film analyzer (upper part of FIG. 14) uses a monochromatic light source #1. If the light is not sufficiently linearly polarized, then a polarizer at position #2 is used to polarize the light. Light impinges the test surface #3 at an angle which is sufficiently removed from Brewster's angle. The light is reflected from the test surface #3 through the polarizer/analyzer combination at position #4 prior to being measured at the detector #5. The detector may be a single photodiode or a photodiode array.

DEPR:
A silicon substrate was prepared by processing diamond sawed wafers from a monocrystalline silicon ingot in a series of steps known to those skilled in the art as lapping. Sawed wafers were lapped with an abrasive material, etched to a more uniform surface profile with acid or caustic solutions, then further lapped to a progressively finer level of surface roughness. For this application, an abrasive preparation of 12-21 micron aluminum oxide particles with a mean size of 15 microns was used to produce a diffusely reflective substrate. For this particular study, the substrate prepared as described above was coated with silicon nitride to a final thickness of 550.ANG.. While this is the combination of materials described, any AR material at varying thicknesses may be used within this invention. The test surface was then treated with a number of the attachment layer materials as described in Example 5.

DEPR:
Sample was mixed 1 part with 1 part of conjugate. Ten microliters was applied to the test surface. After 2 minutes the sample was washed off with water and the wafer was dried with a stream of nitrogen or blotted with a filter device. TMBlue precipitating substrate (TMBlue is a commercially available product, trademarked by Transgenic Sciences, Inc. and disclosed in U.S. Pat. No. 5,013,646) was applied to the same area of the wafer and allowed to stand for 5 minutes. The wafer was washed and dried. A purple spot was visible where the reaction had occurred. This resulting precipitate was then read by eye and ellipsometer to confirm the presence of N. meningitidis. A 1:20,000 dilution of the antigen is clearly resolved from the negative by eye (see, Table 13).

Main Menu | Search Form | Result Set | ShowS Numbers | Edit S Numbers | Referring Patents
First Hit | Previous Document | Next Document
Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC
Help | Logout

Document Number 1

Entry 1 of 31 File: USPT Sep 22, 1998

DOCUMENT-IDENTIFIER: US 5812152 A
TITLE: Image formation method for forming images on lenticular plate, recording apparatus, and information processing system provided with such recording apparatus

DEPR:
Further, by use of an ink jet recording apparatus provided with such encoder, it is possible to measure the amount of offset between the position of the beam emitted from the photointerruptor 11, and the ink discharging portion of the head 2 by the adoption of a method described below. In other words, after the test patterns are printed by use of the head 2, the patterns are read by the photointerruptor 11, which is being reversely carried. Then it should be good enough that the traveling distance of the head 2 from the position of prints to the reading position of the photointerruptor 11 is detected by means of the linear encoder.

DEPR:
Also, in case of a color printer, it is possible to measure the amount of such offset for each color individually. However, the usable colors are limited only to those colors detectable by the application of the waveform of light emitted from the photointerruptor 11. If the LED used for the photointerruptor 11 is such as emitting a green color whose wavelength is approximately 650 nm, it is possible to detect every color of black, cyan, magenta, and yellow used for a usual color printer.

DEPR:
Therefore, the color deviations often occurring in an image formed by a color printer can be minimized if only the offset amount is measured for each of the colors used in order to discharge ink of such colors each individually by the application of optimal timing.

DEPR:
As regards the kinds of the recording head mountable, it may be a single corresponding to a single color ink, or may be plural corresponding to the plurality of ink materials having different recording colors or densities. The present invention is effectively applicable to an apparatus having at least one of a monochromatic mode mainly with black, a multi-color mode with different color ink materials and a full-color mode by the mixture of the colors which may be an integrally formed recording unit or a combination of plural recording heads.

CLPV:
measurement means for setting test patterns by said recording head on said lenticular plate, reading said test patterns by said photosensor in the main scanning direction, while causing the photosensor to scan in the direction opposite to the scanning direction of setting said patterns, and detecting by said encoder the traveling distance of said recording head from the printing position of said recording head to the reading position of said photosensor, and then, for measuring the offset amount between a light emitting position of said photosensor and an ink discharge position of said recording means.

Entry 15 of 17 File: USPT Jun 11, 1991

DOCUMENT-IDENTIFIER: US 5023944 A
TITLE: Optical resonator structures

BSPR:
Due to novel and improved structure, devices in accordance with the present invention provide many advantages. The stacked resonators can be fabricated consistently with conventional techniques such as VPE and MBE and Ion Beam Sputtering, and they require no assembly or alignment past the fabrication stage. Further, because of the stacked architecture, they are wafer space efficient and can be coupled to a single optical beam or single mode optical fiber by Holographic Optical Elements (HOE's) being developed elsewhere. Therefore, many resonator stacks may be easily integrated into a two dimensional array of stacks for use in appropriate systems. Additionally, because all of the resonators are monolithic, they will remain tuned under significant mechanical vibration and temperature variation.

DEPR:
In the first preferred embodiment, at least one of optical cavities 11, 13 or 15 comprises a semiconductor doping profile such that an active region is formed within the optical cavity. The active region, in cavity 15 for example, is capable of being pumped by electron/hole injection so that resonator 14 forms a surface-emitting laser or a light-emitting diode (LED). The direction of light emission, as indicated by arrow 17, is perpendicular to a plane common to mirrors 22, 24 and cavity 15. The remaining resonator/cavity layers of the device may be passive, acting as filters for example, or active, containing doping profiles providing saturable absorbers, electro-absorption media, or optically bi-stable materials, for example.

DEPR:
The first preferred embodiment further provides for exceptional mode discrimination because surface emitting lasers are employed rather than the more conventional edge emitter. Surface emitting lasers have a cavity length typically two orders of magnitudes shorter than conventional edge emitters. In the conventional edge emitter diode laser, the longitudinal modes are typically a few angstroms apart. However, because the surface emitting laser has a cavity length much shorter than the edge emitter, the longitudinal modes are separated by as much as several hundred angstroms. Under these circumstances, the passband of a series of mirrors similar to those with characteristics corresponding to FIG. 2 provides useful mode discrimination.

DEPR:
Substrate 108 is typically a III-V material which may be conductive or semi-insulating. Semiconductor mirrors 112 and 114 are fabricated of a plurality of alternating layers of high and low index semiconductive material. These layers are lattice matched to the semiconductor material in between the mirrors, so that high-quality crystal growth can be achieved throughout the structure. The number, dimensions, and composition of the semiconductor layers comprising the mirror and laser cavity may vary so as to provide frequency selectivity and reflectance/transmittance variation. Laser active region 110 further comprises a semiconductor doping profile such that an active region is formed in the optical cavity. Laser active region 110 is capable of being pumped by electron/hole injection so that the cavity forms a surface-emitting laser. Feedback grating region 116 may be formed by methods such as epitaxial crystal growth, sputtering,

electron beam evaporation, or thermal evaporation techniques, for example. Feedback grating region 116 comprises a material which has a periodic variation in its refractive index.

DEPR:
FIG. 21 illustrates devices in accordance with the present invention adapted for use in parallel array processing structures/architectures involving spatial light modulators. Grids 172 and 174 represent a two-dimensional array of integrated optical devices in accordance with the present invention. Integrated optical devices 172a and 174arepresent two individual devices, one from each of grids 170 and 172 respectively. Lens 176 represents a lens or other beam-handling equipment.

DEPR:
Integrated optical devices 172a and 174a and lens 178 comprise a single channel of the parallel array processing structure which requires the transmission and reception of multiple wavelengths along one optical beam. Therefore, many embodiments of integrated optical devices in accordance with the present invention could be employed to generate, receive, and process optical signals required for the parallel array processing architecture.

Main Menu | Search Form | Result Set | ShowS Numbers | Edit S Numbers | Referring Patents
First Hit | Previous Document | Next Document
Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC
Help | Logout

reacted spot plus background.

DRPR:
Specifically, two such instruments are represented diagrammatically in FIGS. 14a and 14b. The thin film analyzer (FIG. 14a) uses a monochromatic light source #1. If the light is not sufficiently linearly polarized, then a polarizer at position #2 is used to polarize the light. Polarizer #2 must be positioned to allow the maximum intensity of light to pass through to the test surface #3. By off-setting the initial polarizer a component of light polarized perpendicular to the plane of incidence, in addition to the light polarized parallel to that plane, is allowed to interact with the surface. Light impinges the test surface #3 at an angle which is sufficiently removed from Brewster's angle, between 50 and 75 degrees off the normal. The polarizer/detector is set at the same angle from the normal as the incident light source relative to the test surface. The polarizer is set from 2.degree. to 15.degree. above the setting which aligns the polarizers for total extinction of light. Incident angles of 30.degree. to 40.degree. off the normal provide adequate resolution of very dilute samples, but may not provide sufficient range for all applications. The second polarizer, or analyzer polarizer, cannot adequately minimize the background signal when the light is incident on the surface at angles greater than 65.degree.. However, the dynamic range is sufficient to allow for electronic reduction in the background signal. The light is reflected from the test surface #3 through the polarizer/analyzer combination at position #4 prior to being measured at the detector #5. The detector may be a single photodiode or a photodiode array. A blank test surface is placed in the sample position and used to align the second polarizer. The second polarizer should be positioned at an angle with respect to the first polarizer such that it is a few degrees off the minimum (maximum extinction of light through to the detector). Thus, the background of the test surface produces a low detectable signal, but the change in light intensity is now a function of the change in thickness. See Example 26.

DEPR:
A silicon substrate was prepared by processing diamond sawed wafers from a monocrystalline silicon ingot in a series of steps known to those skilled in the art as lapping. Sawed wafers were lapped with an abrasive material, etched to a more uniform surface profile with acid or caustic solutions, then further lapped to a progressively finer level of surface roughness. For this application, an abrasive preparation of 12-21 micron aluminum oxide particles with a mean size of 15 microns was used to produce a diffusely reflective substrate. For this particular study, the substrate prepared as described above was coated with silicon nitride to a final thickness of 550.ANG.. While this is the combination of materials described, any AR material at varying thicknesses may be used within this invention. The test surface was then treated with a number of the attachment layer materials as described in Example 5.

DEPR:
Sample was mixed 1 part with 1 part of conjugate. Ten microliters was applied to the test surface. After 2 minutes the sample was washed off with water and the wafer was dried with a stream of nitrogen or blotted with a filter device. TMBlue precipitating substrate (TMBlue is a commercially available product, trademarked by Transgenic Sciences, Inc. and disclosed in U.S. Pat. No. 5,013,646) was applied to the same area of the wafer and allowed to stand for 5 minutes. The wafer was washed and dried. A purple spot was visible where the reaction had occurred. This resulting precipitate was then read by eye and ellipsometer to confirm the presence of N. meningitidis. A 1:20,000 dilution of the antigen is clearly resolved from the negative by eye (see, Table 13).

DEPR:
A series of seronegative and seropositive human serum samples were used to test the GP41/BSA coated surface. Five microliter samples of serum were applied to the test surface and incubated for 15 minutes at room temperature. Antibody capture on the antigen surface was measured using the Comparison ellipsometer modified with a CCD camera. Results were reported in Grayscale units.

DEPR:
To confirm these observations, a standard antigen dilution curve was generated using the 9 minute assay protocol described in Example 28. Intensities from the antigen dilution curve were measured, using the photodiode modified Comparison Ellipsometer, as a function of incident light wavelength. As the Thin Film

Analyzer is a simplification of the Comparison Ellipsometer similar results are anticipated. Varying wavelengths of incident light were achieved by filtering white light through a narrow bandpass filter to select specific wavelengths. All filters were Corin P70 series filters.

CLPR:
9. The instrument of claim 1, wherein the detector is a photodiode array.

Entry 11 of 17 File: USPT Nov 22, 1988

DOCUMENT-IDENTIFIER: US 4786148 A
TITLE: Color filter having different primary color pigment densities, inter alia

ISY:
1988

BSPR:
As a color filter, a dyed color filter obtained by providing a mordant layer comprising a hydrophilic polymeric material such as gelatin, casein, glue or polyvinyl alcohol on a substrate and dyeing the mordant layer with a colorant to form a color layer is conventionally known. Such a dyeing method has advantages in that there are a large number of available dyes and the required spectral characteristics can be satisfied with relative ease, but is accompanied with several difficulties such that a wet step of dipping a mordant layer in a dyeing bath containing a dye dissolved therein can be controlled only with difficulty is used for the step of dyeing the mordant layer and also complicated steps for providing an intermediate layer for prevention of dyeing for each layer are included, whereby the yield of production becomes poor. Also, the colorants which can be dyeable are relatively low in heat durability, namely up to a temperature of about 150.degree. to 160.degree. C., so that they are difficult to use where thermal treatment is required and the resultant dyed film is inferior in reliability with respect to heat-durability and light fastness.

BSPR:
In case where a color filter of the type described above wherein a colorant, particularly a pigment, is dispersed in a resin, and is used as a color filter for fine or minute color separation, the color filter is composed to comprise a blue resin film, a green resin film and a red resin film arranged in a minute pattern (e.g., of 10.sup.5 .mu.m.sup.2 or smaller) of a mosaic or stripes.

BSPR:
According to the present invention, the scattering effects of the blue resin film, the green resin film and the red resin film in response to incident light are equalized. As a result, even when the view angle from a viewer toward a display picture is changed, it is possible to prevent the change in color balance among blue, green and red on the display picture, whereby a color picture of a high quality can be displayed.

BSPR:
Furthermore, the color filter of the present invention may be composed of colored resin films comprising a resin having good mechanical strength and durability, such as heat durability, light fastness and solvent resistance, together with a pigment. Thus, a color filter having an excellent reliability may be obtained through a simple design and may be prepared with a fine pattern through a simple process involving only ordinary printing steps and photolithographic steps.

DRPR:
FIG. 5 is a partial schematic plan view of a color photosensor array provided with a color filter of the present invention;

DRPR:
FIGS. 7 and 8A-8C are schematic sectional views illustrating dispersion of pigments in color filters of the present invention together with light scattering

states thereby.

DEPR:
Herein, the pigment particle sizes are evaluated by observing the colored resin films through an optical microscope or an SEM (scanning electron microscope).

DEPR:
When light is incident on a particle, the light is scattered, and the scattering intensity is proportional to the square of the volume of the particle and to the reciprocal of the fourth power of the wavelength of the light if the particle size is smaller than the wavelength. This is known as Rayleigh scattering.

DEPR:
Accordingly, if a surface is uneven, scattering similar to Rayleigh scattering is inevitably caused. Thus, in a color filter, if a colored resin film has a rough surface, incident light thereon is inevitably subject to scattering.

DEPR:
A scattering state of incident light is explained with reference to FIG. 7 which is an explanatory view for illustrating a scattering state of incident light due to the surface roughness of a colored resin film. Referring to the figure, on a substrate 71 is formed a colored resin film 72 in which pigment particles 73 are dispersed. When incident light 74 is caused to enter the colored resin film, the incident light is scattered due to the surface roughness of the colored resin film to form scattered light 75.

DEPR:
FIGS. 8A-8C are explanatory views illustrating the light scattering states of a colored resin film depending on the P/V ratio, i.e., the ratio of the weight of the pigment (P) to the weight of the resin (V) in the colored resin film. Referring to FIGS. 8A-8C, when incident light 84 enters a colored resin film containing pigment particles 83 in a resin 82 at a prescribed P/V ratio and found on a substrate, the incident light 84 is scattered due to the surface roughness depending on the P/V ratio to provide scattered light 85. The colored resin films shown in FIGS. 8A-8C are constituted to have successively increasing P/V ratios, thus providing successively increasing scattering rates.

DEPR:
Few conventional photosensitive resins generally used in the photolithographic process provide excellent mechanical characteristics as well as durability such as heat durability, light fastness and solvent resistance which can be different depending on the structure. However, polyamino resins as described above are excellent in these durabilities in view of their chemical structures, so that a color filter obtained therefrom has excellent characteristics.

DEPR:
The color filter of the present invention comprising colored resin films as described above may be formed on an appropriate substrate, which may for example be a glass plate, a transparent resin plate, a resin film, a cathode ray tube display face, the light-receiving face of an image pick-up tube, a wafer on which a solid image pick-up device, such as CCD, BBD, CID or BASIS has been formed, a contact-type image sensor, a liquid crystal display face, or a photosensitive member for color electrophotography.

DEPR:
FIGS. 1A-1F illustrate representative steps involved in a process for producing a color filter comprising a photosensitive colored resin according to the present invention. As shown in FIG. 1A, a prescribed substrate 1 is coated with a colored resin film 2 of a first color in a prescribed thickness by applying a coating liquid wherein a prescribed proportion of a colorant having a desired spectral characteristic is dispersed in a solution of a polyamino-type resin in N-methyl-2-pyrrolidone, followed by prebaking at an appropriate temperature. Then, as shown in FIG. 1B, the colored resin film is exposed to a light (such as a high-pressure mercury lamp) issuing light rays to which the photosensitive colored resin is sensitive through a photomask 3 having a prescribed pattern corresponding to the desired film pattern to be formed, whereby the exposed part of the colored resin is photo-cured.

DEPR:

When a color filter of two or more colors according to the present invention is formed, the steps explained with reference to FIGS. 1A-1D are repeated by using a required number of colored resin coating liquids containing colorants corresponding to respective colors with particle sizes specified according to the present invention, whereby a color filter comprising colored resin film patterns 4, 5 and 6 with three different colors as shown in FIG. 1E is obtained, for example.

DEPR:
The color filter according to the present invention can have protective layer 7 of a material as described above on the colored film patterns as shown in FIG. 1F.

DEPR:
An example of a liquid crystal-electro-optical device using this type of ferroelectric liquid crystal and having a matrix electrode structure is disclosed by Clark and Lagerwall in U.S. Pat. No. 4,367,924.

DEPR:
The blue resin film pattern was observed through an optical microscope to select 100 pigment particles at random and measure the diameters of the particles to obtain an average particle size in terms of an average volume of 1.1.times.10.sup.-4 .mu..sup.3. The blue pigment particles were found to be uniformly dispersed in the resin.

DEPR:
The spectral characteristics of the three color filter patterns obtained in the above-described manner are shown in FIG. 2.

DEPR:
Scattered light from the color filter patterns were obtained by using an integrating sphere (210-2101 (trade name) available from Hitachi K.K.) were measured to obtain a substantially equal scattering rate of about 0.5% for the blue, green and red patterns, respectively. Herein, the scattering rate is defined as the proportion of the scattered light quantity to the incident light quantity.

DEPR:
The color filter also showed a high hardness, was excellent in mechanical characteristics and accordingly did not cause any breakage when the color filter was disposed in contact with and pressed against spacer particles in a liquid crystal cell. Further, the color filter after the curing was excellent in solvent resistance, caused no change in subsequent production steps, and was also excellent in light fastness.

DEPR:
A color filter was prepared in the same manner as in Example 1 except that the particle sizes of the blue pigment, green pigment and red pigment were all adjusted to 1.5.times.10.sup.-4 .mu.m.sup.3 in terms of an average volume. The thus obtained color filter for comparison was examined with respect to the scattering rate in the same manner as in Example 1, whereby the scattering rate was measured to be about 1.0% for blue light (400-500 nm), about 0.5% for green light (500-600 nm) and about 0.3% for red light (600-700 nm).

DEPR:
A wafer having a CCD (charge coupled device) formed thereon was provided as a substrate. A solid-state image pick-up device with a color filter of the present invention was prepared in the same manner as in Example 1 by using the substrate so that the each color pattern of the color filter was disposed in alignment with the respective photo-cells of the CCD to form a three-color stripe color filter.

DEPR:
A color filter prepared in the same manner as in Example 1 was applied to a wafer having a CCD formed thereon so that each color pattern of the color filter was disposed in alignment with the respective photo-cells of the CCD.

DEPR:
As shown in FIG. 6C, a 0.3 .mu.m-thick Al layer 64 was deposited as a conductor layer by the electron-beam evaporation process on the n.sup.+ layer 63. A portion

of the conductor layer 64 providing a photoconversion cell was then removed as shown in FIG. 6D.

DEPR:
By using the protective layer as the substrate, a color filter 35 including three color patterns of blue, green and red was formed in the same manner as in Example 1, whereby a color photosensor array as shown in FIG. 1 wherein each photosensor cell was provided one of the color patterns, was formed.

DEPR:
A color filter prepared in Example 1 was applied onto a photosensor array as shown in FIG. 6F prepared in Example 7 to form a color photosensor array.

DEPR:
The spectral characteristics of the three color filter patterns obtained in the above-described manner were substantially the same as those shown in FIG. 2.

DEPR:
Scattered light from the color filter patterns were obtained by using an integrating sphere were measured to obtain a substantially equal scattering rate of 0.1% or below for the blue, green and red patterns, respectively. Thus, as the haze rate was small, an improved contrast could be obtained, whereby a color filter of good display quality was obtained.

DEPR:
Ordinarily, when scattering is considered, a green filter, for example, is to scatter blue light having a shorter wavelength than green to a larger extent. In an absorption-type color filter using a pigment as in the present invention, such blue light is absorbed by the pigment, whereby the scattering of blue light is advantageously minimized. As a result, scattering is to be considered only with respect to the wavelength of a desired color as in the present invention.

DEPR:
The color filter also showed a high hardness, was excellent in mechanical characteristics and accordingly did not cause any breakage when the color filter was disposed in contact with and pressed against spacer particles in a liquid crystal cell. Further, the color filter after the curing was excellent in solvent resistance, caused no change in subsequent production steps, and was also excellent in light fastness.

DEPR:
The spectral characteristics of the three color filter patterns obtained in the above-described manner were substantially the same as those shown in FIG. 2.

DEPR:
Scattered light from the color filter patterns were obtained by using an integrating sphere were measured to obtain a substantially equal scattering rate of 0.1% or below for the blue, green and red patterns, respectively.

DEPR:
The color filter also showed a high hardness, was excellent in mechanical characteristics and accordingly did not cause any breakage when the color filter was disposed in contact with and pressed against spacer particles in a liquid crystal cell. Further, the color filter after the curing was excellent in solvent resistance, caused no change in subsequent production steps, and was also excellent in light fastness.

DEPR:
As described above, according to the present invention, a color filter comprising three-colored resin film patterns of blue, green and red is provided, wherein a blue pigment, a green pigment and a red pigment having increasing average particle sizes in this order are dispersed in a resin having or not having a photosensitive group in its molecular structure. As a result, the following effects are accomplished.

DEPR:
The scattering rates or intensities from the resin patterns of the respective colors are made substantially the same, so that the view angle dependency of color balance is removed to remarkably improve display qualities in a display

device using the color filter. For the same reason, the color characteristics of a sensor device are also improved.

DEPR:
A color filter according to the present invention can be prepared through simple production steps by using a colorant resin coating material, whereby the color filter having fine patterns is also provided with mechanical strengths and excellent characteristics in various respects, such as heat durability, light fastness, and solvent resistance.